Smoking, Nutrition, Alcohol, Physical Activity, and Obesity (SNAPO) Health Indicators Among College Students in Guam

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Abstract

Background/Purpose: *The Guam Non-Communicable Disease (NCD) Consortium developed action teams as part of their strategic plan to reduce the risk of NCDs. Smoking, Nutrition, Alcohol, Physical Activity, and Obesity (SNAPO) health indicators were targeted. The primary objective of this study was to describe SNAPO among students at the University of Guam.*
Methods*: A cross-sectional study was conducted from September to December 2015 on a non-random sample of students (n=378; 185 males, 193 females) ≥18 years old attending the University of Guam. Information on SNAPO indicators (smoking/tobacco-related uses, poor nutritional behaviors, alcohol use, physical inactivity, and obesity) were collected using questions from the Guam Behavioral Risk Factor Surveillance System and other local studies. Statistical tests were used to determine sex-specific differences.*
Results: *The overall prevalence of SNAPO health indicators included cigarette smoking (9.1%), smokeless tobacco use (6.7%), areca nut chewing (7.5%), alcohol consumption (44.3%) and binge drinking (24.6%), physical inactivity (54.5%), infrequent fruit (77.5%) and vegetable (68.0%) consumption, frequent fast food consumption (31.5%), inadequate water intake (89.1%) and obesity (22.6%). Sex-specific statistical differences were marginal for cigarette smoking and smokeless tobacco use and significant for physical inactivity and obesity.*
Conclusion: *The SNAPO health indicators provide an updated status of substance use and obesity-related risk factors of college students in Guam. Continued collection of the data is encouraged to inform campus-wide policies or programs that promote student health, monitor student health trends, and evaluate the Guam NCD Strategic Plan over time.*

Keywords

Areca (Betel) nut, Alcohol, College students, Health indicators, Non-communicable disease, Nutrition, Physical Activity, Obesity, Smoking, SNAPO, Tobacco

Abbreviations

BMI = Body Mass Index
BRFSS = Behavioral Risk Factor Surveillance Systems
CVD = Cardiovascular disease
NCD = Non-Communicable Disease
PAR-Q = Physical Activity Rating Questionnaire
SD = Standard Deviation
SNAPO = Smoking, Nutrition, Alcohol, Physical Activity, Obesity
SPSS = Statistical Package for the Social Science
UOG = University of Guam
YRBSS = Youth Risk Behavior Surveillance System

Introduction

Approximately 41 million people worldwide die each year from non-communicable diseases (NCD), with 15 million deaths occurring between the ages of 30 and 69 as of 2018.[1] Cardiovascular disease (CVD) was the leading cause of NCD deaths as of 2018 (17.9 of 41 million deaths), followed by cancer (9.0 million), respiratory disease (3.9 million), and diabetes (1.6 million).[1] Guam, an island in the Western Pacific, has been experiencing a similar burden and recently responded by developing the Guam NCD Strategic Plan.[2,3] Cardiovascular disease was the leading cause of NCD deaths on Guam in 2014 (297), followed by cancer (175), cerebrovascular disease (71) and diabetes mellitus (40).[4] The Guam NCD strategic plan describes the Consortium's strategies to improve the health indicators of smoking and smokeless tobacco use (S), nutrition (N), alcohol (A), physical activity (P), and obesity (O), collectively known as SNAPO, to reduce the risk of NCDs in Guam.[2,3]

SNAPO Health Indicators

Smoking increases the risk of developing NCDs such as lung cancer, heart disease, and chronic obstructive pulmonary disease.[5,6] Smokeless tobacco and areca nut use can increase the risk of developing oral cancer and CVD.[5,7,8] The percentage of adults who smoke in Guam decreased from 29.3% in 2014 to 26.4% in 2017, while the percentage of adults who use smokeless tobacco increased from 6.6% in 2014 to 7.9% in 2017.[9] The percentage of adults who chew areca nut also decreased from 12.5% in 2007 to 10.6% in 2010.[10,11] The harmful consumption of alcohol is associated with developing NCDs such as liver cirrhosis, cancer, and CVD.[12] Alcohol use among adults in Guam decreased from 46.5% in 2014 to 43.7% in 2018.[9]

A healthy diet and nutrition protects against NCDs such as diabetes, heart disease, stroke, and cancer.[13] Fruits and vegetables are an important component of a healthy diet.[13] A diet low in fruits and vegetables or high in trans fats could increase one's risks of developing NCDs.[14] In 2017, 44.1% and 26.7% of Guam adults consumed fruits and vegetables, respectively, less often than once a day.[9] Regular physical activity is essential to overall health and can reduce the risk of CVD, cancer, and diabetes.[15] The percentage of adults on Guam who reported that

they did not participate in any physical activity for the past month was 33.4% in 2017, up from 27.7% in 2014.[9] Compared to those with a healthy weight, adults who are obese have a higher risk of developing NCDs such as diabetes, CVD, and cancer.[16,17] The obesity rate reported on Guam increased from 28.0% in 2014 to 34.3% in 2017.[9]

Through the research curriculum in the Health Sciences Program at the University of Guam, students enrolled in the research course began monitoring the health and wellness status of a sample of students. The objective of this paper is to describe the SNAPO indicators of college students, who will be in the future workforce of Guam and the Pacific Islands.

Methods

Ethics approval was obtained from the Committee on Human Research Subjects at the University of Guam (CHRS #15-63). The study was conducted by the students enrolled in the course HS 416 Research in Health Sciences. All members of the research team successfully completed the Protecting Human Subject Research Participants Training offered online by the National Institutes of Health. Additionally, each member underwent training on the consenting of research subjects, the administration of the survey questionnaires, and the collection of anthropometric measurements.

A cross-sectional study was conducted on a non-random sample of students at the University of Guam between September and December 2015. Recruitment flyers were posted throughout the campus, and the student researchers actively sought participants through word-of-mouth. Study participation was limited to students who were at least 18 years old and able to consent to the study in English. The target sample size was 396 students, or 10% of the 3,958 students enrolled during the 2014 – 2015 Academic Year.[18] Of the 392 participants interviewed, 14 (3%) were excluded from the analysis because they were later found to be younger than 18 years old or had failed to provide proper consent. The remaining 378 participants consisted of 185 males and 193 females.

SNAPO Tools

Measurement of Smoking (Cigarette, Smokeless Tobacco, and Areca Nut), Nutrition, and Alcohol

Questions on cigarette smoking and smokeless tobacco, nutrition, and alcohol were adopted from the Behavioral Risk Factor Surveillance System (BRFSS).[19] To assess tobacco use, participants were asked if they currently smoke cigarettes or use chewing tobacco, snuff, or snus. Areca (betel) nut chewing, a behavior sometimes practiced with cigarette smoking and smokeless tobacco use, was assessed using questions developed by Paulino and colleagues.[20] Nutrition characteristics included fruit, vegetable, fast food, and water consumption. The fruit and vegetable intake questions were from the 2015 BRFSS Survey and assessed the frequency in times per day, week, or month. Questions were added to measure fast food frequency (times per day) and water intake, including plain water and other liquids. Reported use reflected intake during the past 30 days.

Measurement of Physical Activity

Physical activity was estimated using the Physical Activity Rating-Questionnaire (PAR-Q) adapted from the Baecke questionnaire and had been used in a previous study of a broader Guam population of adults ages 25-65.[21,22] The PAR-Q was broken down into eight classifications that ranged from 0 to 7, with 0 being defined as least active and 7 being most active. More specifically, the classifications were defined as follows: 0 = avoid walking or exertion (eg, always use elevator, drive instead of walk), 1 = walk for pleasure, routinely use stairs, occasionally exercise sufficiently to cause heavy breathing or perspiration, 2 = 10 to 60 minutes per week, 3 = over one hour per week, 4 = run less than one mile per week or spend 30 minutes per week in a comparable activity as running, 5 = run one to five miles per week or spend 30 to 60 minutes per week participating in a comparable physical activity, 6 = run 5 to 10 miles per week or spend one to three hours per week participating in a comparable physical activity, 7 = run over ten miles per week or spend over three hours per week participating in a comparable physical activity. Participants selected only one classification.

Obesity

The research team was calibrated in the collection of anthropometric measurements, which had to be within 0.2 units. Each student was calibrated against the instructor and a percent agreement was calculated for each student-instructor pair. A percent agreement of 70% or more was required to pass. The median percent agreement was 86% for height and 83% for weight. A stadiometer (Enterprises Stadiometer, Portage, MI) was used to measure height and a weight scale (Perspective and Health O Meter Professionals, Countryside, IL) was used to measure weight. Body mass index (BMI) was calculated as: $[(\text{weight in pounds}) / (\text{height in inches})^2] \times 703$. The BMI was used to categorize participants into categories of underweight (BMI < 18.5), normal weight (18.5 to 24.9), overweight (25.0 to 29.9), or obese (≥ 30).[15] Body fat was measured using the Omron Fat Loss Monitor, Model HBF-306C/Black (Omron Healthcare Inc., Lake Forest, IL). All measuring equipment were calibrated weekly.

Statistical Analysis

The data were entered the following semester, Spring 2016, by students enrolled in the course HS 451 Research and Report Writing. The research students cleaned and analyzed the data using the Statistical Package for Social Sciences (SPSS™), ver-

sion 22 (International Business Machines Corporation, Armank, NY). The chi-square test for independence was used to test the relationship of selected categorical variables with sex. The independent t-test was used to compare the means of selected continuous variables between males and females. Values of $P < .05$ were considered statistically significant. Some variables were recoded. Smoking, alcohol, and areca nut use frequency responses were recoded into yes (every day and some days) and no (never) responses. Vegetable and fruit consumption variables were recoded into yes (less than one time per day) and no (one or more times per day) to reflect the units reported in the BRFSS. Fast food consumption was recoded to yes (three or more times per week) and no (less than three times per week). Water consumption, which included plain water and other liquids, was recoded to yes (adequate intake of 3.7 or more liters for males or 2.7 or more liters for females) and no (less than 3.7 liters for males or less than 2.7 liters for females).[23] Physical activity was recoded into sedentary (PAR-Q score of 0-4) and active (PAR-Q score of 5-7), while the four BMI categories were collapsed into obese (BMI ≥ 30) and not obese (BMI < 30).

Results

Characteristics of Sample

The mean age of participants was 22.7 ± 3.5 years as shown in Table 1. Of the 378 students, 185 (48.9%) were males and 193 (51.1%) were females. All class levels were represented: 51 (13.5%) freshmen, 82 (21.7%) sophomores, 127 (33.6%) juniors, 109 (28.8%) seniors, and eight (2.1%) post-baccalaureate or graduate students. Ethnicity was classified into single (67.5%) or mixed (31.7%) categories, with the largest groups being Filipino (31.8%), CHamoru (20.9%), or both (10.8%). For employment and marital status, the majority of students reported being employed (59.3%) and single (93.1%). The students in this study represented 9.5% (378 of 3,958) of the university's enrolled population, and the sex and major ethnic distributions were quite similar to the University's enrollment distributions.[18]

SNAPO Health Indicators

As shown in Table 2, the SNAPO-related indicators of the college students were compared between sexes and reported alongside the values extracted from the 2015 Guam BRFSS, which served as the adult reference population. The smoking indicators included cigarettes, smokeless tobacco, and areca nut. The percentages among the college students were 9.1% for cigarette smoking, 6.7% for smokeless tobacco, and 7.5% for areca nut. The sex-specific difference was not significant for areca nut and only marginally significant ($P = .05$) for cigarette smoking and smokeless tobacco use, with higher usage in males versus females (12.0% versus 6.3% for cigarette smoking and 9.2% versus 4.3% for smokeless tobacco use). Cigarette smoking and areca nut use appeared lower in college students than in the BRFSS.

The nutrition indicators included low frequency consumption of fruits and vegetables, high frequency consumption of fast foods, and low consumption of water (from plain water and other liquids). The sex-specific distributions were similar for all nutrition indicators. The percentage of college students with low frequency consumption was 77.5% for fruits and 68.0% for vegetables. The low frequency of fruit and vegetable consumption in college students was higher than in the BRFSS. Additionally, the percentage of college students with frequent fast food consumption was 31.5%. The percentage with inadequate water intake, including plain water and other beverages, was 89.1%. Unfortunately, data on fast food and water consumption were not available in the 2015 BRFSS.

Alcohol use was measured at 44.3% among the college students, with 24.6% engaging in binge drinking. Compared to the BRFSS, binge drinking was slightly higher in the college students, though college males and females reported similar alcohol consumption patterns.

Table 1. Characteristics of the 378 College Students, Guam, 2015

	Mean ± SD or Frequency (%)
Age, years	22.7 ± 3.5
Grade Level	
Freshman	51 (13.5)
Sophomore	82 (21.7)
Junior	127 (33.6)
Senior	109 (28.8)
Post-baccalaureate / Graduate	8 (2.1)
Gender	
Males	185 (48.9)
Females	193 (51.1)
Ethnicity	
Single	255 (67.5)
Predominant: Filipino	120 (31.8)
CHamoru	79 (20.9)
Mixed	120 (31.7)
Predominant: CHamoru / Filipino	41 (10.8)
CHamoru / Japanese	13 (3.4)
Employed for Wages	
Yes	224 (59.3)
No	153 (40.5)
Marital Status	
Single	352 (93.1)
Married	17 (4.5)
Divorced	4 (1.1)
Common-law	4 (1.1)

Results may not add up to total sample size due to some participants refusing to answer
SD = Standard deviation

Table 2. Smoking, Nutrition, Alcohol, Physical Activity, and Obesity (SNAPO) Health Indicators of the Adult Reference Population and the College Students Stratified by Sex, Guam, 2015

	Adult Reference Population[a] Frequency (%) or Mean ± SD	College Student Population[b] All Frequency (%) or Mean ± SD	College Students Males Frequency (%) or Mean ± SD	College Students Females Frequency (%) or Mean ± SD	*P*-value[c]
Smoking					
Cigarette					
Yes	358 (25.9)	34 (9.1)	22 (12.0)	12 (6.3)	.052
No	1247 (74.1)	340 (90.9)	161 (88.0)	179 (93.7)	
Smokeless Tobacco					
Yes	98 (7.1)	24 (6.7)	16 (9.2)	8 (4.3)	.057
No	1506 (92.9)	336 (93.3)	157 (90.8)	179 (95.7)	
Areca Nut					
Yes	13,404 (12.5)[d]	28 (7.5)	16 (8.7)	12 (6.3)	.382
No	93,641 (87.5)[d]	345 (92.5)	168 (91.3)	177 (93.7)	
Nutrition					
Fruits, <1 time per day					
Yes	659 (42.3)	293 (77.5)	141 (76.2)	152 (78.7)	.622
No	872 (57.7)	85 (22.5)	44 (23.7)	41 (21.2)	
Vegetables, <1 Time Per Day					
Yes	394 (27.1)	257 (68.0)	121 (65.4)	136 (70.4)	.322
No	1108 (72.9)	121 (32.0)	64 (34.5)	57 (29.5)	
Fast Foods, ≥ 3 Times Per Week					
Yes	NA	100 (31.5)	50 (31.8)	50 (31.2)	.909
No	NA	217 (68.5)	107 (68.1)	110 (68.7)	
Water (Plain Water and Other Liquids), Met Daily AI[e]					
Yes	NA	40 (10.9)	20 (11.2)	20 (10.6)	.841
No	NA	327 (89.1)	158 (88.8)	169 (89.4)	
Alcohol					
Yes	698 (41.8)	153 (44.3)	72 (43.6)	81 (45.0)	.475
Binge drink[f]	298 (19.8)	93 (24.6)	46 (24.8)	47 (24.3)	.908
No	896 (58.2)	192 (55.7)	93 (56.4)	99 (55.0)	
Physical Activity					
Sedentary (PAR-Q = 0-4)	1148 (79.2)[g]	205 (54.5)	79 (42.9)[c]	126 (65.6)	0
Active (PAR-Q = 5-7)	321 (20.8)[g]	171 (45.5)	105 (57.1)	66 (34.4)	
Obesity					
Obese (BMI ≥ 30)	459 (30.8)	77 (22.6)	46 (28.0)[c]	31 (17.5)	.020
Not Obese (BMI < 30)	1129 (71.0)	264 (77.4)	118 (72.0)	146 (82.5)	
Percentage of Body Fat	NA	24.0 ± 8.6	20.1 ± 8.0[c]	27.7 ± 7.4	0

Results may not add up to total sample size due to participants refusing to answer
[a] Reference population source is the 2015 Behavioral Risk Factor Surveillance System (BRFSS) Survey for Guam, n = 1669
[b] College students of n = 378
[c] Reflects sex-specific comparisons among the college students; statistically different from college females at P ≤ .05
[d] Reflects weighted data from state-added questions
[e] Reflects the Adequate Intake: 3.7 liters for males and 2.7 liters for females, ages 19 to 30 years old
[f] Reflects ≥5 drinks in males and ≥4 drinks in females in any one occasion
[g] Reflects BRFSS calculation on the "number of adults that participated in enough aerobic and muscle strengthening exercise to meet guidelines"
SD = Standard deviation
NA = Not available in 2015
PARQ = Physical Activity Readiness Questionnaire
BMI = Body mass index

The overall percentage of sedentary students was 54.5% while active students was 45.5%. Physical inactivity was statistically significantly higher in females (65.6%) than in males (42.9%). In Table 2, the activity levels appeared higher in college students than in the BRFSS.

The percentage of obesity among the college students was 22.6% and was statistically significantly higher in males (28.0%) than in females (17.5%). The mean percent body fat of the college students was 24.0% ± 8.6% and was statistically significantly lower in males (20.1%) than in females (27.7%). This type of obesity measurement was not available in the BRFSS.

Discussion

The percentages of cigarette smoking (9.1%), smokeless tobacco use (6.7%), areca nut use (7.5%), and binge drinking (24.6%) provide a current overview of substance use among college students in Guam. Similarly, the percentages of frequent fast food consumption (31.5%), inadequate water intake (89.1%), physical inactivity (54.5%), and very high BMI weight status (22.6%) provide a current, comprehensive overview of obesity-related risk factors among college students. Compared to the adult population of Guam in 2015, the lower percentages of cigarette smoking, areca nut use, physical inactivity and obesity, and higher percentages of binge drinking and infrequent fruit and vegetable consumption among college students suggest behavioral differences in substance use and obesity-related risk factors between the two populations.[9] Therefore, the results of this study may not be generalizable to the adult population of Guam but may be used to monitor the health indicators of the college students and supplement the Guam BRFSS data.

The sex-specific differences were marginal for cigarette smoking and smokeless tobacco, with higher use in males. These differences were consistent with findings from Spangler and colleagues (2014) which found cigarette smoking and being male, among other variables, to be correlated with smokeless tobacco use among first year college students.[24] Among the substances reported, the percentages of smokeless tobacco (9.2% in males and 4.3% in females) and binge drinking (24.8% in males and 24.3% in females) were each reported at a higher percentage than in the United States (3.9% smokeless tobacco, 16.3% alcohol).[9] Furthermore, there are no reports on the prevalence of areca nut use in the United States; however, compared to the global estimate of 10%, Guam had a slightly higher percentage at 12.5% among the adult population and a lower percentage of 6.7% among college students found in this study.[25] Other sex-specific differences were statistically significant for physical inactivity, obesity, and percentage of body fat.

Males were significantly more active than females; however, obesity, calculated via BMI, was also significantly higher in males than in females. In contrast, the mean percent body fat in males (20.1% body fat), calculated using the Omron body fat measuring device, was significantly lower than in females (27.7% body fat). The sex differences within and between types of obesity measurements may be due to biological differences, such as hormone levels and body fat percentage, and obesity categorization based on BMI, which may not be a reliable indicator for athletes as it does not reflect regional body fat distribution.[26-28]

The limitations of this study include non-random sampling and the absence of trending substance use indicators such as e-cigarette and marijuana use.[29] Inclusion of the e-cigarette and marijuana use will be considered in upcoming academic years. Despite the non-random approach to recruitment, the study sample reflected the university's sex distribution and dominant ethnic groups, and thus the health SNAPO health indicators in this study are presumably representative of the university's student population. The study findings were immediately disseminated to the student body via the first Health Awareness to Reach Tritons (HART) Fair on campus. The data stimulated discussion on the need for campus-wide policies or programs that promote student health. The population surveyed in this study will enter the future workforce of Guam and the neighboring Pacific. This is a critical time for primary prevention since students are young enough to implement lifestyle changes to prevent the onset of NCDs. Working to build a healthy workforce now may translate to a healthy economy in the future.

Conclusion/Recommendations

The SNAPO health indicators in this study provided the current status of substance use and obesity-related risk factors of college students in Guam. The profile of the student health indicators is quite different from the adult population in Guam. The use of the student SNAPO indicators to: (1) supplement the BRFSS and other data sources to evaluate the Guam NCD Strategic Plan, (2) monitor health trends among college students, and (3) inform campus-wide policies or programs that promote student health is strongly encouraged.

Conflict of Interest

None of the authors identify any conflict of interest.

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